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DOCUMENT-IDENTIFIER: US 20020000931 A1
TITLE: User interface for a two-way satellite communication system

Abstract Paragraph:
A system, method and computer-readable medium for directing an antenna for transmission over a two-way satellite communication system via a graphical user interface (GUI), including receiving via the GUI location information associated with the antenna; downloading via the GUI antenna pointing parameters, displaying via the GUI the antenna pointing parameters; and instructing a user via the GUI to selectively point the antenna based upon the downloaded antenna pointing parameters.

Summary of Invention Paragraph:
[0003] The present invention relates to a satellite communication system, and is more particularly related to a user interface for a two-way satellite communication system.

Summary of Invention Paragraph:
[0005] Modern satellite communication systems provide a pervasive and reliable infrastructure to distribute voice, data, and video signals for global exchange and broadcast of information. These satellite communication systems have emerged as a viable option to terrestrial communication systems. As the popularity of the Internet continues to grow in unparalleled fashion, the communication industry has focused on providing universal access to this vast knowledge base. Satellite based Internet service addresses the problem of providing universal Internet access in that satellite coverage areas are not hindered by traditional terrestrial infrastructure obstacles.

Summary of Invention Paragraph:
[0006] The Internet has profoundly altered the manner society conducts business, communicates, learns, and entertains. New business models have emerged, resulting in the creation of numerous global businesses with minimal capital outlay. Traditional business organizations have adopted the Internet as an extension to current business practices; for example, users can learn of new products and services that a business has to offer as well as order these products by simply accessing the business's website. Users can communicate freely using a wide variety of Internet applications, such as email, voice over IP (VoIP), computer telephony, and video conferencing, without geographic boundaries and at nominal costs. Moreover, a host of applications within the Internet exist to provide information as well as entertainment.

Summary of Invention Paragraph:
[0007] Satellite communication systems have emerged to provide access to the Internet. However, these traditional satellite-based Internet access systems support unidirectional traffic over the satellite. That is, a user can receive traffic from the Internet over a satellite link, but cannot transmit over the satellite link. The conventional satellite system employs a terrestrial link, such as a phone line, to send data to the Internet. For example, a user, who seeks to access a particular website, enters a URL (Universal Resource Locator) at the user station (e.g., PC); the URL data is transmitted over a phone connection to an

Internet Service Provider (ISP). Upon receiving the request from the remote host computer where the particular website resides, the ISP relays the website information over the satellite link.

Summary of Invention Paragraph:
[0008] The above traditional satellite systems have a number of drawbacks. Because a phone line is used as the return channel, the user has to tie up an existing phone line or acquire an additional phone line. The user experiences temporary suspension of telephone service during the Internet communication session. Another drawback is that the satellite communication set-top box has to be located reasonably close to a phone jack, which may be inconvenient Further, additional costs are incurred by the user.

Summary of Invention Paragraph:
[0009] Based on the foregoing, there is a clear need for improved approaches for providing access to the Internet over a satellite communication system. There is a need to minimize costs to the user to thereby stimulate market acceptance. There is also a need to permit existing one-way satellite system users to upgrade cost-effectively. There is also a need to eliminate use of a terrestrial link. Therefore, an approach for providing access to a packet switched network, such as the Internet, over a two-way satellite communication system is highly desirable

Summary of Invention Paragraph:
[0010] According to the present invention, there is provided a novel system, method and computer-readable medium for directing an antenna for transmission over a two-way satellite communication system via a graphical user interface (GUI), including receiving via the GUI location information associated with the antenna; downloading via the GUI antenna pointing parameters; displaying via the GUI the antenna pointing parameters; and instructing a user via the GUI to selectively point the antenna based upon the downloaded antenna pointing parameters. The above arrangement advantageously minimizes installation time of the two-way satellite communication system for the user, thereby stimulating market acceptance.

Brief Description of Drawings Paragraph:
[0012] FIG. 1 is a diagram of a two-way satellite communication system configured to provide access to a packet switched network (PSN), according to an embodiment of the present invention;

Brief Description of Drawings Paragraph:
[0020] FIG. 9 is a flow chart of the antenna pointing operation associated with the auto-commission process of FIG. 8; FIGS. 10a-10m are illustrations of a graphical user interface for a two-way satellite communication system corresponding to the flow charts of FIGS. 8 and 9, in accordance with an embodiment of the present invention;

Brief Description of Drawings Paragraph:
[0022] FIG. 12 is a diagram of a computer system that can support the interfaces for two-way satellite communication, in accordance with an embodiment of the present invention.

Detail Description Paragraph:
[0025] Although the present invention is discussed with respect to protocols and interfaces to support communication with the Internet, the present invention has applicability to any protocols and interfaces to support a packet switched network, in general.

Detail Description Paragraph:
[0026] FIG. 1 shows a two-way satellite communication system that is configured to provide access to a packet switched network (PSN), according to an embodiment of the present invention. A two-way satellite communication system 100 permits a user

terminal, such as a PC 101, to access one or more packet switched networks 103 and 105 via a satellite 107. One of ordinary skill in the art would recognize that any number of user terminals with appropriate functionalities can be utilized; e.g., personal digital assistants (PDAs), set-top boxes, cellular phones, laptop computing devices, etc. According to an exemplary embodiment the packet switched networks, as shown, may include the public Internet 105, as well as a private Intranet 103. The PC 101 connects to a transceiver 109, which includes an indoor receiver unit (IRU) 109a, an indoor transmitter unit (ITU) 109b, and a single antenna 111, to transmit and receive data from a network hub 113--denoted as a network operations center (NOC). As will be explained in greater detail with respect to FIG. 4, the hub 113 may include numerous networks and components to provide two-way satellite access to PSNs 103 and 105. The user terminal 101 can transmit data to the NOC 113 with an uplink speed of up to 128 kbps, for example, and receive data on the downlink channel with speeds of up to 45 Mbps. As shown in the figure, the NOC 113 has connectivity to Intranet 103 and the Internet 105, and supports a multitude of applications (e.g., software distribution, news retrieval, document exchange, real-time audio and video applications, etc.), which may be supplied directly from a content provider or via the Internet 105.

Detail Description Paragraph:
[0039] The system 100 also supplies multimedia services, which provide one-way IP multicast transport. The NOC 113 relays a configurable set of IP multicast addresses over the downlink channel. An information provider may pass IP multicast packets to the NOC 113, either via a terrestrial line or via the return channel. The receiving PCs may receive the IP multicast through the standard Winsock with IP Multicast extensions API. To prevent unauthorized access, each IP multicast address may be cryptographically protected. Thus, PC 101 may only have access to an address if it has been authorized by the NOC 113. Hardware filtering in the Indoor Receive Unit (IRI) 109a allows the reception of any number of different IP Multicast addresses.

Detail Description Paragraph:
[0040] The NOC 113, which provides network management functions, allocates to each multimedia information provider a committed information rate (CIR), and one or more IP multicast addresses. The CIR specifies the fraction of the broadcast channel bandwidth that is guaranteed to the data feed provider. Each IP Multicast address operates as a separate data stream that is multiplexed on the one broadcast channel.

Detail Description Paragraph:
[0044] As previously indicated, the IRU 109a may have a Universal Serial Bus (USB) interface, which is a standard interface to PC 101 to provide IRU control and data. The IRU 109a may be attached to the PC 101 dynamically, and may be loaded with operational software and initialized by PC driver software. Received traffic is forwarded to the PC 101 through the USB connection 301. The PC driver communicates with the IRU 109a for control over the USB channel. By way of example, the receive chain F-connector on an RG-6 cable is connected to the IRU 109a to communicate to the LNB 305. The IRU 109a contains an interface that may be used to transfer data to control the transmit unit and to actually provide the transmit data to the ITU 109b. A clock is received on this channel to ensure that transmit frame timing and transmit symbol clocks are synchronized.

Detail Description Paragraph:
[0048] The transceiver 109 supports a variety of features that enhance the flexibility and efficiency of the two-way system 100. Transceiver 109 can be implemented as a receive-only unit that can be later upgraded to support a two-way configuration. In other words, the transceiver 109 may be configured either as a receive-only package or a transmit upgrade package. The transceiver 109 may be designed to be an add-on capability to a standard receive-only transceiver. Thus, in actual implementation, a user can either purchase an upgrade to a transceiver

109 to support a satellite-based return channel or can operate a receiver with no transmit portion for communication over the satellite 107. Such a receive-only system may employ a terrestrial return channel (e.g., phone line) for two-way IP traffic.

Detail Description Paragraph:
[0059] The timing support equipment 409 includes multiple gateway up-link modules (GUMs) 409a and 409b. The GUMs 409a and 409b provide a translation of IF signals to L-band so the signals can be received on a receive-only unit, which controls a GCE switch (not shown) and on a timing unit 409c. The GUMs 409a and 409b receive a signal from the GCE and provides the L-Band signal either directly to a Quality Monitor PC (QMPC) (not shown) or through a splitter (not shown) to multiple receivers; one of these is connected to the system IF distribution module 403 for the uplink signal. The QMPC may be a standard receive-only version of the transceiver 109 with a relay card that controls the RCU. The QMPC, according to one embodiment of the present invention, may include a PC with the Windows operating system. The QMPC can operate with the IRU 409d, thereby permitting the IRU 409d to be used in the QMPC. The IRU 409d may be able to support more channels because the data is not forwarded to the host and more MAC addresses are used. According to one embodiment, the addressing scheme for messages supports up to 16 million adapters (i.e., transceivers); extending beyond the private class "A" IP address. Accordingly, MAC addressing supports a greater number of adapters that IP addressing. The high order nibble of the byte, which is currently set to "0Ah" (10), may be used to give 16 fold improvement to 256 million adapters.

Detail Description Paragraph:
[0067] The NCC 411a may be configured to control several RCEs 411. The site may be assigned to the NCC 411a at ranging time. "Ranging" is a process which configures a site on a NCC 411a and adjusts timing of the NCC 411a without user intervention. Sites may periodically either be moved to another NCC 411a, which supports a different set of return channels or may be completely decommissioned from the NOC 113. For instance, a site may be moved to another NCC 411a, as needed, for load balancing. The system 100 is capable of communicating site moves between NCCs 411a so the sites are no longer enabled on the prior NCC 411a. In addition, a de-commission of the site from the CAC server 425 may disable the site at the NCC 411a. According to one embodiment of the present invention, the NCC 411 a can access the same database (not shown) as that are used by the conditional access and auto-commissioning systems.

Detail Description Paragraph:
[0071] When a frame is received from a receiver, the first byte of data may indicate the Gateway ID for this serial number. The received frame may be mapped to an IP address by the NCC 411a and stored for the particular individual receiver. Accordingly, other packets can be received by this receiver without the 1-byte overhead for the gateway on every packet. The NCC 411 forwards the packet to the appropriate gateway after building an IP-in-IP packet that is compatible with the UDP tunneled packets sent to the gateways.

Detail Description Paragraph:
[0072] According to one embodiment, the NCC 411a may utilize the Microsoft.RTM. Windows operating system. The NCC 411a need not processes or transmit frame timing messages. The NCC 411a may support changing the format of outbound messages to include new MAC addresses as well as different return channel headers. In addition, NCC 113 tracks return channel gateway address to IP mapping; this information is periodically provided to receivers. NCC 411a may also update and effect BCD configuration files, which can be locally stored and managed, without software restart. NCC 411a can support a large number of transceivers 109 (e.g., at least 100,000 transceivers).

Detail Description Paragraph:

[0080] The communication among the components 419, 109a, 101, 109b, 307, 411b, and 411a is facilitated by the following interfaces: NOC to IRU Interface 501, IRU to PC Interface 503, IRU to ITU Interface 505, IRT to ODU Interface 507, ODU to BCD Interface 509, BCD to NCC Interface 511, and NCC to Gateway Interface 513. The NOC to IRU interface 501 is layered to include DVB, PIDs, and MAC addresses. The IRU to PC Interface 503 uses USB super frames to send a large amount of data in a USB burst to the host PC 101 The payloads of the super frames are IP datagrams with the IP header. A new format header may be used for each message to provide timing and other information to the host PC 101. In the IRU to ITU interface 505, the IRU 109 may break the IP datagram into bursts to transmit to the NOC 113 The IRU 109 may send a frame format message for each frame if there is data to transmit.

Detail Description Paragraph:
[0081] The internal NOC interface, IRU to BCD interface, is layered to include the burst structure, the return channel frame format, and the message structure for NCC 411a messages. The NCC 411a may forward traffic to the appropriate gateway 419 (e.g., dedicated gateway or hybrid gateway) in the NOC 113. The data forwarded to the gateway 419 may be re-formatted in a UDP datagram to allow the NOC 113 to receive the traffic as if it were received over a UDP return channel.

Detail Description Paragraph:
[0082] The NOC to IRU interface 501 may utilize a multi-layer protocol, which includes the following layers: a DVB transport stream, which can support multiple multiprotocol encapsulation messages, for example, in a single MPEG frame per the implementation and includes fixed-size 204 byte MPEG packets (which contain 188 bytes of user traffic and 16 bytes of FEC data); a DVB PID, which the receiver may filter traffic based on PIDs; and a DVB MPE, which the receiver may filter traffic based on MAC Address and may process MPE headers for user traffic. The receiver may also process service tables for PAT and PMT; data following the MPE header has been added to support encrypted traffic. The multi-layer protocol of the NOC to IRU interface 501 may include an IP Payload (the payload of the MPE is expected to be an IP packet including IP headers) and RCE Messages. It should be noted that specific MAC addresses may be used for return channel messages, which may originate from the NCC 411a or from a timing unit 409c.

Detail Description Paragraph:
[0083] With respect to the DVB transport stream, the DVB standard multiprotocol encapsulation standard over data piping is employed. The multiprotocol header includes the following fields used by system 100: a MAC Address field (e.g., 6 bytes in length); an encryption field (e.g., a 1 bit field that can be set if the packet is encrypted); and a length field for specifying the length of the packet header. If encryption is disabled for the packet, the IP header and payload immediately follow the MPE header. If encryption is enabled, then the first 8 bytes contain the initialization vector for packet decryption. This vector includes a packet sequence number used to detect out-of-sequence packets. The satellite gateway 413 removes packets from the TTR buffers and transmit them on an outroute. The payload and padding are transmitted following an appropriately formatted MPE header and the initialization vector (for encrypted packets). The payload of the multiprotocol encapsulation frame is determined by the encryption value in the MPE header. If encryption is enabled for the packet, then the first 8 bytes contain an initialization key that also acts as the sequence number. If encryption is disabled, the packet is the IP payload, which is DVB compliant.

Detail Description Paragraph:
[0085] As shown in FIG. 5b, a TTR buffer 521 is carried as the data field of a multicast UDP/IP packet 523, which includes a multicast IP header 525 and a UPD header 527 The TTR buffer 521 includes the following fields: a Gateway ID field 529 (8 bits) for specifying the sending gateway ID; a Number of Packets field 531 (8 bits) for indicating the number of packets in this TTR buffer; and a TTR Sequence Number field 533 (16 bits) for specifying the sequence number. The TTR Sequence

Number field 533 is used by the satellite gateway 413 (in conjunction with the Gateway ID) to detect TTR buffers lost on the backbone LAN. The TTR Sequence Number field 533 is sent least significant byte first; a value of 0 is always considered to be in sequence. The TTR buffer 521 also includes N packets 535. Within each packet 535 are the following fields: a DES Key field 537, two MAC Address fields 539, a Length field 541, a Sequence Number field 543, a Payload field 545, a Padding field 547, and an Alignment field 549. The DES Key field 537, which is 8 bytes in length, specifies the encryption key to be used by the satellite gateway 413 to encrypt the packet 523. When no encryption is required (e.g., for NCC 411a packets), zero is placed in this field 537. Two copies of the MAC Addresses (each have a 6-byte length) are stored in field 539. The first copy is the spacelink MAC address placed in the DVB Header. The second copy of MAC Address is supplied for backward compatibility. The Length field 541 (2 bytes) indicates the length of the packet 535 (least significant byte first). The Sequence Number field 543 indicates the packet number of this Next TTR frame. In an exemplary embodiment, the Payload field 545 has a variable length from 1 to 8209 bytes and stores the message that is to be sent on the outroute (e.g., an IP packet). The length of the Payload field 545 may be limited to the maximum Ethernet frame size, for example. The Padding field 547, which may vary from 0 to 3 bytes, makes the packet 535 a multiple of long words when transmitted on the outroute; this is required for proper DES encryption. The Alignment field 549 is a 2 byte field and provides filler between packets, ensuring that the next packet starts on a 4 byte boundary. The Padding field 547, in an embodiment of the present invention, leaves the packet 535 2 bytes short of the proper boundary to optimize satellite gateway 413 processing of the TTR buffer 521.

Detail Description Paragraph:
[0089] The following types of addresses may be used within a Return Channel of system 100: Ethernet MAC addresses; IP unicast addresses; and IP multicast addresses. For most IP based communication, UDP is used on top of IP. All references to communication using IP (unicast or multicast) addresses, also imply the use of an appropriate (configurable) UDP port number. In some cases, for example, the conditional access IP multicast address and the flow control IP multicast address, the same specific IP address may be used with different UDP port numbers.

Detail Description Paragraph:
[0090] Each LAN port in the NOC 113 has an Ethernet MAC address assigned to it. The Ethernet MAC address of a LAN port is simply the burned in IEEE MAC address of the NIC (Network Interface Card) that is used to implement the LAN port. The PC may also use Ethernet MAC addressing if a NIC is attached to the PC for forwarding traffic onto a LAN.

Detail Description Paragraph:
[0091] System 100 also makes use of multicast Ethernet MAC addresses for carrying multicast IP traffic and the broadcast Ethernet MAC address for carrying broadcast IP traffic. All communication at the NOC 113 (and most of the communication within system 100 in general) is IP based. Every NOC component has (at least) one IP unicast address for each of its LAN ports. These addresses are local to the subnet to which the LAN port is attached.

Detail Description Paragraph:
[0092] Specific receivers are assigned an IP Unicast address that may be used for all unicast traffic to and from the transceiver. This address is allocated to the site at auto-commissioning time and is bound to the TCP protocol for the USB adapter on the user equipment. At the same time, a specific gateway is configured with the serial number/IP address mapping for that transceiver. These unicast addresses may be private addresses since the interface to the internet in both directions may be through NOC equipment that can translate to a public IP address.

Detail Description Paragraph:
[0093] In addition to its Satellite Card IP unicast addresses, Transceiver 109 uses a private class-A IP address based on the serial number for its CAC individual traffic. IP multicast addresses are used (for efficiency) for all communication on the MUX LAN 421 where there are potentially multiple receivers, including cases where the multiple receivers only exist because of redundancy. There are at least four types of IP multicast addresses used in system 100: (1) the satellite gateway IP multicast address; (2) conditional access IP multicast addresses; (3) the flow control IP multicast address; and (4) User traffic IP Multicast addresses. The first three address types are private to the MUX LAN 421; the fourth address type is public and used for the traffic LAN 423.

Detail Description Paragraph:
[0094] The addresses may be selected by the hub operator and configured into the appropriate components. The satellite gateway IP multicast address is used to forward messages to the satellite gateway 413 to be transmitted onto the outroute. All of the senders of traffic (the Gateways, the NCC 411A, the CAC, and the Local Timing Unit) send to this same address. Messages are sent to the satellite gateway 413 in TTR buffers. TTR buffers are UDP/IP multicast packets with a specific format for the UDP data field. satellite gateway handling of TTR buffers, as previously described.

Detail Description Paragraph:
[0095] A conditional access IP multicast address may be used by the CAC Server 425 to send conditional access messages to all of the gateways. Two conditional access IP multicast addresses may be used: one for sending key information for unicast traffic, and one for sending key information for multicast traffic. Separate addresses may be defined for this purpose to minimize key handling load on gateways that do not need to process a large number of individual keys.

Detail Description Paragraph:
[0096] The flow control IP multicast address is used by the satellite gateway 413 to send flow control messages to all of the Gateways. The NCC 411a may be configured with the IP Multicast addresses it is allowed to forward to the traffic LAN. Each gateway may be configured with the set of IP multicast addresses that it may forward to the outroute. If messages appear on the Traffic LAN which match an address in the gateway, the gateway formats the data into TTR buffers and uses the key provided by the CAC server 425 for the multicast address.

Detail Description Paragraph:
[0100] The CAC Server 425 sends decryption keys to the transceivers 109. Unicast keys may be sent in Periodic Adapter Conditional Access Update (PACAU) messages, addressed to the specific transceiver's unicast conditional access spacelink MAC address. The PACAUs also may contain multicast keys for the multicast service elements for which the transceiver 109 has been enabled. The mapping of service elements to actual multicast addresses may be sent by the CAC Server 425 in Periodic (Data Feed) Element Broadcast (PEB) messages. These messages may be sent to the broadcast conditional access spacelink MAC address. All of the transceivers 109 receive the PEB messages. The transceiver 109 also supports the reception of the extended PEB format, which allows a virtually unlimited number of IP multicast addresses by providing the capability to segment the PEB.

Detail Description Paragraph:
[0102] Outbound multicast user traffic, (e.g. file broadcast or MPEG-2 video), is received by an access gateway. The access gateway may be configured with the list of IP multicast addresses that it should forward and receives encryption keys for these IP multicast addresses from the CAC Server 425. If the gateway receives an IP packet with a multicast address that has not been enabled, the packet is discarded. The IP gateway forwards an IP packet for a multicast address that has been enabled, along with the appropriate spacelink MAC address and encryption key, as a packet

payload in a TTR buffer. The satellite gateway 413 may extract the IP packet from the TTR buffer, encrypts it and forwards it to the outroute.

Detail Description Paragraph:
[0103] An application on the PC 101 opens an IP multicast when it wants to receive the Outbound Multicast stream. The driver may calculate the appropriate MAC address and configures the IRU 109a to receive traffic on the MAC address. The PC driver may forward IP packets based on the multicast address to the applications that have opened the address.

Detail Description Paragraph:
[0105] Base upon the user service plan selections, connections may be initiated through the Internet 105 to a specific transceiver 109 by using the IP address associated with the transceiver. If the transceiver 109 is using Network Address Translation (NAT) to the Internet 105, Internet-initiated connections may not be possible since the public Internet address is not associated with a specific private address associated with the transceiver until a connection is initiated from within the NOC 113.

Detail Description Paragraph:
[0106] The TCP User traffic, when initiated at the PC 101, may be passed through the system 101 as follows. PC 101 sends an IP Packet to IRU 109a; in turn, the IRU 109a transmits IP packets (possibly in multiple bursts) to the NOC 113. The NCC 411a reassembles and forwards the IP packet to the gateway. The gateway communicates with the destination host and receives the response. The gateway sends the IP packets to the IRU 109a. A NCC 411A may receive return channel packets from the return channels. Each packet may be a subset or a complete IP packet. When the packet is a partial IP packet, the complete IP packet may be reassembled prior to passing the IP packet to an access gateway. First and last bits and a sequence number may be used in each return channel frame to provide the necessary information for the NCC 411a to rebuild the message. The NCC 411a may be able to rebuild packets from many transceivers at once. In addition, multiple data streams may be supported from the same transceiver to support prioritization of traffic.

Detail Description Paragraph:
[0107] Within the system 100, packets are formatted using multiprotocol encapsulation. Therefore, all packets include a DVB-standard header that includes a MAC address. For different types of traffic, the MAC address is set differently. The following types of MAC addresses exist: Unicast traffic; Multicast traffic; Unicast conditional access; Multicast conditional access; Return Channel Broadcast messages; and Return Channel Group messages.

Detail Description Paragraph:
[0110] A unicast traffic MAC address may be used for traffic that is sent over the outroute to a specific receiver. The MAC address is determined by the serial number of the IRU 109a; the same MAC address is also used for CAC individual traffic. The IP Multicast address is determined from the IP multicast address using the TCP standard. This standard only maps the last two octets of the IP address and part of the second octet of the IP address. Therefore, addresses should be configured to ensure that multiple IP addresses that map to the same MAC address are not used.

Detail Description Paragraph:
[0111] The transceiver 109 periodically receives a list of keys for multicast traffic. If the transceiver 109 is enabled to receive the multicast address, then the IRU 109a may enable reception of the appropriate MAC address when an application uses standard Winsock calls to receive from an IP multicast address. Part of enabling the address may be the retrieval of the relevant encryption key and passing that key to the IRU 109a.

Detail Description Paragraph:

[0112] The Unicast Conditional Access MAC address is used by the CAC Server 425 to send unicast conditional access messages to a specific transceiver. The address is the same as its unicast traffic MAC. Information about a site's access to different multicast streams and whether it is enabled are periodically transmitted to a site over this address.

Detail Description Paragraph:
[0114] The Return Channel Messages address is used for messages that may be received by all adapters 109 on specific transponders, including those messages required for the commissioning process. Theses messages received on this address are processed directly in the IRU 109a, so the IP header is not used at the receiver and should be ignored. The IP datagram includes the following packet types: a Super-frame Numbering Packet (SFNP), which provides a timing reference and identification for the transponder; and an Inroute Group Definition Packet (IFDP), which defines available return channel groups and resources available on each group.

Detail Description Paragraph:
[0115] The Return Channel Group Messages address is used for messages sent on a specific return channel group to transceivers 109, which are assigned to the particular group. The grouping is implemented to provide a scalable approach to transmitting information so that a single site does not need to process 300 return channels. The messages received in this address are processed by the IRU 109a, so the IP header is not used by the receiver and should be ignored. The IP datagram may include the following packet types: Bandwidth Allocation Packet (BAP), Inroute Acknowledgement Packet (IAP), and Inroute Command/Ack Packet (ICAP). The BAP contains the bandwidth allocation structure and the allocation of the bursts to each site on the group. The IAP contains a list of the bursts for a specific frame and a bitmask indicating if the frame was successfully received at the NOC 113. The ICAP contains a list of commands to be sent to IRUs 109a from the NCC 411a.

Detail Description Paragraph:
[0116] Exemplary packets are sent for local processing in the IRU 109a to support the Return channel. Because these packets can be identified based on the MAC address, they need not be encrypted; consequently, these MAC Addresses can be dynamically added and removed by the IRU 109a. All of these packets that are intended to be processed from the IRU 109a may have UDP/IP headers on them, but these headers may be ignored and assumed to be correct from the IRU 109a, an exception is that since there may be padding on the Outroute for word alignment, the length of these packets may be taken from the UDP Header.

Detail Description Paragraph:
[0120] FIGS. 6A-6O are diagrams of the structures of exemplary packets used in the system of FIG. 1. The SFNP packet is used to lock network timing for the return channels and as a beacon to identify the proper network. A super frame numbering packet (SFNP) 601, as seen in FIG. 6A, includes an 8-bit frame type field 601a, which has a value of 1 to specify that the packet 601 is a SFNP. A Timing Source field 601b has a length of 1 bit and is used to distinguish the particular timing unit that generated the SFNP. This field 601b may be used to resolve confusion during switchover between redundant timing references in the NOC 113. A 7-bit Version field 601c is used to indicate the return channel protocol version. If an adapter 109 does not recognize a protocol version as specified in this field 601c, then the adapter 109 does not transmit or use any of the incoming packets that are related to the return channels. According to one embodiment of the present invention, this protocol may only append additional information onto the packet 601, without changes to these existing fields. In this manner, a beacon function for dish pointing can be maintained, irrespective of version.

Detail Description Paragraph:
[0122] The SFNP uses 1 packet per Super Frame, or 2 Kbps of bandwidth, and is

transmitted on the beacon multicast address. The processing of these packets are as follows. If the FLL (frequency lock loop) Lock is lost, then no timing can be derived from the SFNP, and network timing is declared as out of Sync. Both timing source may be monitored, if present, but a change in selection may only be made after receiving 3 consecutive SFNP from the same source when no network timing source is selected. In addition, network timing is declared as in Sync, only after receiving 3 consecutive SFNP from the selected timing source, and having the local timing match within a given number of clocks. This may typically require 4 super frame times. Network timing is declared as out of Sync, after receiving 2 consecutive SFNP from the selected timing source, and having the local timing being off by more than a given number of clocks. Additionally, network timing is declared as out of Sync, and the network timing source becomes unselected, after not having received any SFNP for 3 super frame times. Further, network timing is declared as out of Sync, and the network timing source becomes unselected, after not receiving 2 consecutive SFNP for a given number of super frame times. In addition, network timing is declared as out of Sync, and the network timing source becomes unselected, after not receiving 3 consecutive SFNP for a given number of super frame times.

Detail Description Paragraph:
[0124] As seen in FIG. 6b, an inroute group definition packet 603 includes the following fields: a Frame Type field 603a, an Inroute Group ID (identification) 603b, a Reserved field 603c, a Return Channel Type field 603d, an Aloha Metric field 603, a Ranging Metric field 603f, and a Frequency Table field 603g. For the inroute group definition packet 603, the 8-bit Frame Type field 603 a has a value of 2. The Inroute Group ID field 7 is 7 bits long and identifies a particular inroute group. The 13-bit Reserved field 603c has a 0 value and is ignored during reception. The Return Channel Type field 603d use 4 bits to indicate the type of return channels that are defined in the inroute group; e.g., the value of 0 is defined as 64 Kbps with convolutional encoding. The Aloha Metric field 603 (a 16 bit field) is used for random weighted selection of a return channel group when going active, and is based on the number of Aloha bursts that are defined and the collision rate on those bursts. The metric value also accounts for loading on the NCC 411A, or the Return channel Group. For example, a value of 0 indicates that Aloha is not currently available on this Return channel Group. The Ranging Metric field 603f, which is 16-bits, is used for random weighted selection of a Return channel Group when performing Nonallocated Ranging. The ranging metric value is based on the number of Nonallocated Ranging bursts that are defined and associated collision rate on those bursts. For example, a value of 0 indicates that Nonallocated Ranging is not currently available on this Return channel Group Lastly, the packet 603 has a variable length (N.times.24 bits) Frequency Table field 603g, which is used to transmit on each of the return channels in the group. Changing the Frequency for a return channel must be carefully coordinated to avoid interruptions of network operation, or transmission on the wrong return channel frequency around the switch over point. According to one embodiment, there is an upper bound of no more than 4K return channels between all return channel groups for an outroute. The upper bound for the number of return channels in each return channel group depends on the limit of the number of Burst Allocations in the Bandwidth Allocation Packet (FIG. 6c). The value of N is derived from the length of the IP Datagram; this uses 1 packet per Return channel Group per Super Frame, or 26 Kbps of bandwidth for 75 Return channels per Group, and 300 return channels. The packet 603 is transmitted on the all IRU Multicast address.

Detail Description Paragraph:
[0129] A bandwidth allocation packet (BAP), shown in FIG. 6C, is used to define the current bandwidth allocation for all inroutes connected to an Inroute Group. The packet 605 includes an 8-bit Frame Type field 605a (which has a value of 3 to indicate a BAP), and a 16-bit Frame Number field 605b, which indicates the Frame Number that is allocated in this packet 605, and may be larger than the current Frame Number. The difference between the frame numbers is a fixed offset to allow

the IRU 109a sufficient time to respond to changes in bandwidth allocation. A Burst Allocation field 605c has a length of N.times.24 bits and specifies all the burst allocations for each Inroute. The field 605c may order all the bursts in a Frame, and may repeat a Frame for each Inroute in the Group; the field 605c is limited to no more than 489 entries, since IP Datagrams are limited to 1500 bytes. This feature enables the IRU 109a to perform a linear search. An incorrect Burst Allocation Table can cause improper operation of the network, as there is limited error checking on this field 605c. The value of N is derived from the length of the IP Datagram.

Detail Description Paragraph:
[0131] For each Frame, the IRU 109a may receive another Bandwidth Allocation Packet from the Inroute Group it is currently expecting to receive bandwidth allocation on. The IRU 109a may need to scan the entire table to obtain the necessary information to transmit data, and process acknowledgements. In an exemplary embodiment, the Burst Allocation field 605c may contain the following fields: Inroute Group, Inroute Index, Frame Number, BurstID, Burst Offset, Burst Size, and Acknowledgement Offset. Since the IRU 109a can be monitoring two Inroute Groups, the IRU 109a may need to confirm the Inroute Group based on the MAC Address of the packet 605, and only process the Bandwidth Allocation Packet 605 for which IRU 109a expects to use bandwidth. The Inroute Index is the Cumulative Burst Offset DIV Slot Size of a frame, and is used as an index into the Frequency Table field 603g of the Inroute Group Definition Packet 603. Frame Number within the Bandwidth Allocation field 605c can come from the Frame Number field 605b of the packet 603. A BurstId field may be the 4 least significant bits of the Index into the Burst Allocation field 605c. The Cumulative Burst Offset starts at 0, and increases with the each Burst Size. The Burst Offset is effectively the Cumulative Burst Offset MOD Slot Size of a Frame. The Burst Size may come from the Burst Allocation packet (FIG. 6D). An Acknowledgement Offset field is an Index into the Burst Allocation Table of the entry.

Detail Description Paragraph:
[0132] This uses 1 packet per Inroute Group per Frame, or 535 Kbps of bandwidth for 25 active users per inroute, 75 Inroutes per Group, and 300 inroutes. Since it is transmitted on the Inroute Group's Multicast address, each IRU may only have to process 134 Kbps.

Detail Description Paragraph:
[0138] FIG. 6e shows the structure of an inroute acknowledgement packet, according to an embodiment of the present invention. An inroute acknowledgement packet contains the following fields: a Frame Type field 609a, a Frame Number field 609b, an ACK field 609c. For this type of packet, the Frame Type field 609a is given a value of 4. The Frame Number field 609b specifies the Frame that the acknowledgement applies, which may be less than the current Frame Number. The ACK field 609c is a bitmap, that matches the entries for this Frame in the Burst Allocation field 605c of the Bandwidth Allocation Packet 605. To determine what was acknowledged, the IRU 109a may determine which bursts were assigned to it by the Bandwidth Allocation Packet 605, recalling the data that was transmitted during those bursts. The value of N is derived from the length of the IP Datagram, and may match the value of N from the associated Bandwidth Allocation Packet 605.

Detail Description Paragraph:
[0139] This uses 1 packet per Inroute Group per Frame, or 57 Kbps of bandwidth for 25 Active Users per Inroute, 75 Inroutes per Group, and 300 inroutes. Since it is transmitted on the Inroute Group's Multicast address, each IRU may only have to process 15 Kbps.

Detail Description Paragraph:
[0140] FIG. 6f shows the structure of an inroute command/acknowledgement packet, according to an embodiment of the present invention. An inroute

command/acknowledgement packet 611 is used to explicitly acknowledge Aloha and Nonallocated Ranging bursts, and to send commands to an Adapter. Acknowledgment packets are sent on the Inroute Group's Multicast address, and commands are sent on the All IRU Multicast address. These packets are multicast to reduce Outroute bandwidth, and since there is no IRU unicast address. The inroute command/acknowledgement packet 611 includes the following fields: a Frame Type field 611a, a Reserved field 611b, Number of Entries field 611c, Frame Number field 611d, Offset Table field 611e, Padding field 611f, and a Command/Acknowledgment field 611g. For this type of packet 611, the 8-bit Frame Type field 611a is set to a value of 5 A 3-bit Reserved field 611b is unused and set to 0 for transmission; the field 611b is ignored on reception. The Number of Entries field 611c, a 5-bit field, specifies the number of entries in the Offset Table field 611e. For Acknowledgments, the 16-bit Frame Number field 611d indicates the frame that is being acknowledged; for Commands, the field 611d specifies the frame that the command is directed towards. The Offset Table field 611e (with N.times.10 bits) provides a table of offsets for where each of the variable sized Command/Acknowledgment fields 613 begin. The size of the field 611e is known based on the Command field 613, but can also be derived from the Offset for the next Entry, or the size of the IP Datagram for the last entry. Each offset is a 10 bit value, and starts from the beginning of the Offset Table field 611e. The value of N is the Number of Entries. Padding field 611f varies in length from 0 to 6 bits and provides byte alignment at the end of the Offset Table field 611e. A Command/Acknowledgment field 613 has a length of N.times.8 bits and provides a list of Commands or Acknowledgments, sorted by serial number (SerNr); these commands and acknowledgements are defined according to FIGS. 6G-6L. It should be noted that no more than one Command or Acknowledgment can be sent to an adapter per packet. The value of N is derived from the length of the LP Datagram.

Detail Description Paragraph:
[0151] If synchronization problems are discovered, the NCC 411a can force the adapter inactive by removing its bandwidth allocation. This may cause the adapter to reset its sequence number and datagram counter to 0, and start at the beginning of a new datagram. This may also cause the flushing of all Backlogged datagrams in the IRU. Since the sequence number is reset every time the adapter goes active, any data sent in Aloha or Nonallocated Ranging bursts may be duplicated due to retransmissions, if the acknowledgement is lost.

Detail Description Paragraph:
[0155] The Frame Number field 625d stores the 2 least significant bits of the frame number, and may help the NCC 411A to determine which burst was received. The 4-bit Burst Number field 625e indicates the burst slot that the Frame was transmitted in, assisting with identifying that burst as an Aloha type burst. The 8-bit Length FEC field 625f is the FEC value for the length, produced via table lookup in software. The 8-bit Length field 625g is the length of the burst and includes all the bytes starting with the Backlog Indicator field 625b through the CRC field 625m. The 8-bit Serial Number High field 625h stores the 8 most significant bits of the of the Source adapter's serial number. The Destination ID field 625I specifies the destination hybrid gateway. The Backlog field 625j indicate the number of bytes of Backlog that are present. It's encoded as a floating point number with a 2 bit exponent field and a 6 bit mantissa, and may be rounded up by the IRU. The end of the Backlog is indicated by 8.sup.Backlog[7:6].times.Backlog [5:0].times.2+SeqNr+size the Encapsulated Datagram field. As such, it may include out of order, acknowledged data. It is only included to indicate increases in the size of the backlog, as measured from the IRU. The size of this field is sufficient for just under 2 seconds at 256 Kbps. The Padding field 625k, if present, has its first byte indicating the total number of Padding bytes (N); all the other bytes are "Don't Care". This field 625k is used to allow for stuffing packets to maintain link utilization when no data needs to be transferred, and to allow the padding of packets to the minimum burst size for Turbo codes. The N.times.8-bit Encapsulated Datagrams field 625l contains 0 or more bytes of encapsulated datagrams. There is

no relationship between IP Datagram boundaries and the contents of this field; i.e., this field 625l can contain a section of an IP Datagrams, or multiple IP Datagrams. The value of N can be derived by subtracting the size of the other fields in the packet from the Length. The CRC field 625m stores a 16-bit CRC; a burst with an invalid CRC is dropped and statistics retained.

Detail Description Paragraph:
[0157] The Frame Number field 627d stores the 2 least significant bits of the frame number, and may help the NCC 411A to determine which burst was received. The 4-bit Burst Number field 627e indicates the burst slot that the Frame was transmitted in. With the addition of the Inroute and Frame number it was received on, the NCC 411A may be able to uniquely identify the source (SerNr) and destination (DestId). The 8-bit Length FEC field 627f is the FEC value for the length, produced via table lookup in software. The 8-bit Length field 627g is the length of the burst and includes all the bytes starting with the Backlog Indicator field 627b through the CRC field 627m. The 8-bit Sequence Number High field 627h stores the 8 most significant bits of the sequence number field that is used for the retransmission protocol. This is the Selective Acknowledgement, sliding window, byte address of the first byte of the Encapsulated Datagrams field. With a 32 Kbyte window size, this is large enough for 1 second at 256 Kbps. The Backlog field 627j, Padding field 627j, Encapsulated Datagrams field 627k, and CRC field 627m are similar to the fields 625j, 625k, 625l, and 625m of packet 625.

Detail Description Paragraph:
[0158] Some of the packets sent to the NCC 411a do not require an IP header. Therefore, bandwidth savings are made by sending much smaller datagram headers, as shown in FIG. 60. The packet 629 includes a 4-bit Reserved field 629a, which should have a value of 0 during transmission and may be used to specify Encryption, Compression, or Priority values. A Datagram Counter/CRC field 629b (12-bits) stores a 12 bit Datagram Counter value, from which a 12 bit CRC can be calculated by software on this Encapsulated Datagram appended with the SerNr and DestId; and the result is stored in this field 629b over the Datagram Counter value. The purpose of this field 629b is to detect loss of Synchronization between the IRU 109a and the NCC 411a, thereby ensuring uncorrupted reassembly, correct source and destination addresses, and no loss of datagrams. Failures on this CRC should be considered as a synchronization failure, and the IRU 109a should be forced to the inactive state by the NCC 411a, so as to initiate resynchronization. The polynomial to use in calculating this CRC is X.sup.12+X.sup.11+X.sup.3+X.sup.2+X+1 (0.times.F01), and the preset (initial) value is 0.times.FFF. The packet 629 also includes a 4-bit Protocol Version field 629c; this field 629c may be encoded as 0 to indicate Network Management datagrams. Further, this value may be explicitly prohibited from being sent from the Host driver, for Network Security reasons. Further the packet 629 contains an 8-bit Message Type field 629e for specifying the message type, a 16-bit Length field 629f for indicating the length of the datagram (including the header), and a Payload field 629g, which is a variable length field (N.times.8 bits). The value of N is the Length field that is present for all Payload formats.

Detail Description Paragraph:
[0159] FIG. 6p shows the inroute payload format for IP datagrams. The datagram 631 includes a Reserved field 631a, a Datagram Counter/CRC field 631b, and a Protocol Version field 631c, which are similar to that of the datagram of FIG. 60. In addition, the datagram 631 contains a Header Length field 631d (4 bits) for storing the IP header length, a Type of Service field 631e (8 bits) for specifying the type of service, a Length field 631f (16 bits) for storing the length of the entire datagram including the header, and a Rest of Datagram field 631g (N.times.8 bits). Details of the rest of the IP frame are described in IETF (Internet Engineering Task Force) RFC 791, which is incorporated herein by reference. The value of N is derived from the Length field. It should be noted that the prior header includes the first four bytes of the IP header.

Detail Description Paragraph:
[0162] Each of the gateways to be supported by the NCC 411a is configured into the NCC 411a. For each gateway ID, the NCC 411a has the gateway address to gateway IP address mapping. This mapping may be periodically sent to all of the receivers The receiver uses the mapping transmission to determine which gateway id is associated with its gateway IP address and informs the IRU 109a which gateway ID to use for inbound messages when it first becomes active using an ALOHA burst. This may support modes where the gateway IP address is dynamically set at connection setup time.

Detail Description Paragraph:
[0163] The source address may be the lower 28 bits of the 32 bit transceiver serial number. This is used for packet rebuilding. Messages may be sent by serial number to a receiver for polling, bandwidth allocation, and retransmission support.

Detail Description Paragraph:
[0192] A user may commission the two-way site with no access to a phone line or to the Internet 105. In step 801, the user installs software in the PC 101. The PC 101 executes the auto setup program, as in step 803. For example, when the user starts the setup program from a CD (compact disc), the user may enter location information. To be as user-friendly as possible, the information may be in terms of country, state/province (optional), and city, or ZIP code. From this information, the PC 101 may estimate the latitude and longitude of the site and select a two-way "beacon" for the site based upon the information on the CD. The program instructs, as in step 805, the user to point the antenna to the beacon satellite using predefined pointing values. The system 100 provides a default satellite 107 and associated default transponder, whereby a user terminal 101 undergoing the commissioning process may establish communication with the NOC 113. The system, however, may be configured using an existing phone dial-up networking service as shown in FIG. 10a. In FIG 10a, the auto setup program generates a welcome window 1001. The welcome window 1001 may include, for example, a task list section 1003 for detailing the tasks to be performed by the auto setup program, a details section 1005 for providing details of a task currently being performed by the auto setup program, a "Back" button 1009, a "Next" button 1011 and an "Exit" button 1013.

Detail Description Paragraph:
[0194] Upon a successful antenna pointing (and ranging), a temporary channel is established, as in step 807, from the transceiver 109 to the NOC 113 via satellite 107. The software may be capable of communicating over the system 100 to an "auto-commissioning server" in the NOC 113 to perform the two-way interaction required to sign the user up for two-way access. The auto-commissioning process, however, may also be performed via an existing dial-up networking connection as shown in FIGS. 10c and 10d. In FIG. 10c, the auto setup program generates a dial out window 1023 for using an existing dial-up connection. The dial out window 1023 may include, for example, a connections drop-down list 1025 for selecting a dial-up account to be used by the auto setup program, a user name entry field 1027 for providing a user name, a password entry field 1029 for providing a user password and a details section 1031 for providing details of a task currently being performed by the auto setup program.

Detail Description Paragraph:
[0202] The program indicates whether the antenna is pointed to the correct satellite (step 907) via the signal strength meter 1075. The program may indicate whether the user is pointed to a known incorrect satellite or an unknown incorrect satellite, as well as the correct satellite. If the antenna is not pointed to the correct satellite 107, then the user adjusts the antenna position, per step 909. The user checks whether the antenna is properly position to exhibit an acceptable signal strength, as indicated by the setup program (step 911) via the signal strength meter 1075. This measurement provides digital signal strength for a

demodulated carrier. If the signal strength is below an acceptable level, then the user must re-adjust the antenna (step 909). This approach requires another person to read the PC Antenna pointing screen 1071 while the antenna is adjusted; alternatively, the user may listen to an audible tone by enabling the speaker selection box 1077. Upon obtaining acceptable signal strength, the antenna process ends and a confirmation window 1081 is generated as shown in FIG. 10m. In FIG. 10m, the confirmation window 1081 may include, for example, an information section 1083 for summarizing network parameters, such as IP address, host name, email address, SMTP/POP3 server names, NNTP news server name, etc., generated by the auto setup program.

Detail Description Paragraph:
[0211] FIG. 12 is a diagram of a computer system that can execute and support the system interfaces and protocols of system 100, in accordance with an embodiment of the present invention. Computer system 1201 includes a bus 1203 or other communication mechanism for communicating information, and a processor 1205 coupled with bus 1203 for processing the information. Computer system 1201 also includes a main memory 1207, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 1203 for storing information and instructions to be executed by processor 1205. In addition, main memory 1207 may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 1205. Computer system 1201 further includes a read only memory (ROM) 1209 or other static storage device coupled to bus 1203 for storing static information and instructions for processor 1205. A storage device 1211, such as a magnetic disk or optical disk, is provided and coupled to bus 1203 for storing information and instructions.

Detail Description Paragraph:
[0212] Computer system 1201 may be coupled via bus 1203 to a display 1213, such as a cathode ray tube (CRT), for displaying information to a computer user. An input device 1215, including alphanumeric and other keys, is coupled to bus 1203 for communicating information and command selections to processor 1205. Another type of user input device is cursor control 1217, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 1205 and for controlling cursor movement on display 1213.

Detail Description Paragraph:
[0214] Further, the instructions to support the system interfaces and protocols of system 100 may reside on a computer-readable medium. The term "computer-readable medium" as used herein refers to any medium that participates in providing instructions to processor 1205 for execution. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media includes, for example, optical or magnetic disks, such as storage device 1211. Volatile media includes dynamic memory, such as main memory 1207. Transmission media includes coaxial cables, copper wire and fiber optics, including the wires that comprise bus 1203. Transmission media can also take the form of acoustic or light waves, such as those generated during radio wave and infrared data communication.

Detail Description Paragraph:
[0215] Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read.

Detail Description Paragraph:
[0217] Computer system 1201 also includes a communication interface 1219 coupled to bus 1203. Communication interface 1219 provides a two-way data communication

coupling to a network link 1221 that is connected to a local network 1223 For example, communication interface 1219 may be a network interface card to attach to any packet switched local area network (LAN). As another example, communication interface 1219 may be an asymmetrical digital subscriber line (ADSL) card, an integrated services digital network (ISDN) card or a modem to provide a data communication connection to a corresponding type of telephone line. Wireless links may also be implemented. In any such implementation, communication interface 1219 sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information.

Detail Description Paragraph:
[0218] Network link 1221 typically provides data communication through one or more networks to other data devices. For example, network link 1221 may provide a connection through local network 1223 to a host computer 1225 or to data equipment operated by a service provider, which provides data communication services through a communication network 1227 (e.g., the Internet). LAN 1223 and network 1227 both use electrical, electromagnetic or optical signals that carry digital data streams. The signals through the various networks and the signals on network link 1221 and through communication interface 1219, which carry the digital data to and from computer system 1201, are exemplary forms of carrier waves transporting the information. Computer system 1201 can transmit notifications and receive data, including program code, through the network(s), network link 1221 and communication interface 1219.

Detail Description Table CWU:
1TABLE 1 Field Size Scope Description Serial Number 24 Bits Unicast Serial number burned into the IRU IP Multicast 20 Bits Multicast IP Multicast addresses are 32 bit Address addresses with format a.b.c.d, where octet "a" may be 224-239. Type Indicator 2 Bits All Indicates type of address: 1 - Multicast 2 - Unicast 3 - Internal multicast

Detail Description Table CWU:
2TABLE 2 Address Type Value MAC Address (Hex) Unicast User Traffic Serial Number 1 02 00 0A 00 00 01 Serial Number 2 02 00 0A 00 00 02 Serial Number 256 02 00 0A 00 01 00 IP Multicast Traffic 225.2.3.4 01 00 6E 52 03 04 239.221.204.1 01 00 6E 5D CC 01 Unicast Cond Access Serial Number 1 02 00 0A 00 00 01 Serial Number 2 02 00 0A 00 00 02 Serial Number 256 02 00 0A 00 01 00 Multicast Cond Access Broadcast 03 00 00 00 00 00 Return Channel Messages Broadcast 03 00 00 00 00 01 RC Group Messages Broadcast - RCE1 03 00 01 00 00 01 Broadcast - RCE2 03 00 01 00 00 02

CLAIMS:

1. A method for directing an antenna for transmission over a two-way satellite communication system via a graphical user interface (GUI), the method comprising: receiving via the GUI location information associated with the antenna, downloading via the GUI antenna pointing parameters; displaying via the GUI the antenna pointing parameters; and instructing a user via the GUI to selectively point the antenna based upon the downloaded antenna pointing parameters.

25. A system for directing an antenna for transmission over a two-way satellite communication system, the method comprising: means for receiving information associated with the antenna; means for downloading antenna pointing parameters; means for displaying the antenna pointing parameters; and means for instructing a user to selectively point the antenna based upon the downloaded antenna pointing parameters.

37. A computer-readable medium carrying one or more sequences of one or more instructions for directing an antenna for transmission over a two-way satellite communication system via a graphical user interface (GUI), the one or more sequences of one or more instructions including instructions which, when executed

by one or more processors, cause the one or more processors to perform the steps of: receiving via the GUI location information associated with the antenna; downloading via the GUI antenna pointing parameters; displaying via the GUI the antenna pointing parameters; and instructing a user via the GUI to selectively point the antenna based upon the downloaded antenna pointing parameters.